

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR PATENT

MEMORY CARD ELECTRICAL CONTACT STRUCTURE

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CROSS-REFERENCE TO A RELATED APPLICATION

This application claims the benefit of provisional application serial no. 60/140,963, filed June 24, 1999, which provisional application is incorporated herein by this reference.

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BACKGROUND OF THE INVENTION

This invention relates to a small card containing digital memory, such as a non-volatile flash EEPROM system, having exposed surface electrical contacts that allow easy connection to and removal from a receptacle of a host electronic system or device, particularly portable devices, in order to provide removable electrical connection between the system or device and the memory within the card through the exposed surface contacts of the card.

Small memory cards are increasing in popularity for use in small hand held devices such as cellular telephones, music players and other personal electronic equipment. Memory cards are being made smaller for such applications while the size of their individual external surface electrical contacts are not being reduced in size to any significant degree. This presents a challenge to the design and packaging of such memory cards. In a specific example, an existing commercial Multi-Media Card (MMC) product has been manufactured and sold for a time. The MMC has seven surface contacts extending across a short edge of the rectangular card that also includes a cut-off corner. Evolving applications for this type of memory card have made it necessary to add several external contacts without increasing the size of the card.

SUMMARY OF THE INVENTION

This has been accomplished by increasing the number of contacts of the row of contacts used on the MMC product while maintaining the position of the row along the short edge of the rectangularly shaped card. This maintains a degree of compatibility between the MMC product and the new card, known as a SD Card product. In order to increase the number of contacts, two contacts are positioned in the space previously occupied by one and another contact is positioned at the cut off corner and set back from the card edge a distance that is greater than other contacts of the row.

Additional features, objects and advantages of the present invention are included in the following detailed description, which description should be read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an isometric view of the improved removable memory card, showing its top, front side and left side;

Figure 2 is a top plan view of the memory card of Figure 1;

Figure 3 is an expanded view of a portion 41 of the top plan view of Figure 2, most accurately showing the structure of its recesses and contacts;

Figure 4 is a sectional view of the memory card of Figure 1, taken at section 4-4 of Figure 2; and

Figure 5 is a bottom plan view of the memory card of Figure 1.

DETAILED DESCRIPTION OF THE MEMORY CARD

One or more integrated circuit chips (not shown) forming the memory system are encased in a plastic card 11 of generally rectangular shape in plan view with three corners being slightly rounded and the fourth corner being cut to form an angled surface (edge) 13 between a front side 15 and a left side 17. As shown in the drawings, the angled edge 13 intersects the adjacent sides 15 and 17 with substantially the same angle, about 45 degrees. Ten electrical contacts

connected with the memory circuit chip(s) within the card are positioned in nine recesses in the top surface along the front side (edge) 15 and the angled edge 13. Because of the small size of the card, two contacts of smaller size are positioned in one of the recesses and a single contact of smaller size is positioned in a recess along 5 the angled edge 13. Of course, a different number of contacts may alternately be used.

More specifically, as best shown in Figure 3, recesses 19-26 are provided in a row along the front side (edge) 15 and a recess 27 along the angled edge 13. Each of the recesses is elongated in a direction perpendicular to the front 10 side 15, provides a recessed bottom surface that is parallel with the top surface of the card and has walls surrounding three sides that make it more difficult for fingers handling the card to touch the contacts within the recess. The contacts are positioned a small distance from the front side (edge) of the card for the same purpose. But since each of the recesses opens outward through the front side 15 or 15 edge 13 of the card, mating contacts of a receptacle (not shown) easily slide into and out of the recesses over the contacts within them as the card is respectively inserted into or removed from the receptacle.

The recesses 20-26 each contain a respective one of rectangularly shaped electrical contacts 31-37, respectively. In the same area occupied by any one 20 of these contacts, two contacts 38 and 39 are positioned in the recess 19. In this example, the contact 38 is positioned behind the contact 39. One contact 40 of this smaller size is positioned in the recess 27 because that recess is shorter than the others. A front edge of the contact 40 is displaced a further distance away from the front card edge 15 than are the other contacts 31-37 and 39. Ten contacts are thus 25 positioned across the small width of the card instead of just eight contacts of the same width that would fit along the front side 15 alone.

As shown in Figure 5, a label may be attached to a bottom of the card 11 in a slight recess 43 provided in the bottom surface for that purpose.

Although the invention has been described as implemented in a specific card example, it will be understood that the invention is entitled to protection within the scope of the appended claims.